Table 3-1. Field Sites on the Illinois River: Date of Selection and River Miles

Date	*Rivers miles traveled*	*Sites selected*
9/18/95	RM 263 - RM 282.5-RM 263	UP1, UP2
9/19/95	RM 263 - RM 264.3 - RM 263	UP3
9/19/95	RM 263 - RM 244	UP4, UP5
8/28/95	RM 240 - RM 244 - RM 225.6	Sites 1, 2, 3, 4, 5
8/29/95	RM 225.6 - RM 160	Sites 6, 7, 8, 9, 10
8/30/95	RM 160 - RM 116.5	Sites 11, 12, 13, 14, 15
8/31/95	RM 116.5 - RM 79.4	Sites 16, 17, 18, 19, 20
9/1/95	RM 79.4 - RM 0.	Sites 21, 22, 23, 24

Table 3-2. Field Sites on the Upper Mississippi River: Dates of Reconnaissance and the River Miles

Date	*River miles traveled*	*Sites selected*
9/11/95	838-793	1
9/12/95	793-753	2, 3, 4 (up, mid sections)
9/13/95	753-725	4 (downstream), 5, 6, 7
9/14/95	725-663	8, 9
9/15/95	663-620	10
9/16/95	620-583	11, 12, 13, 14
9/17/95	583-522.5	15, 16
9/18/95	522.5-484	17, 18, 19
10/2/95	484-437.3	21
10/3/95	437.3-410.5	22, 23, 24, 25, 26
10/4/95	410.5-343.2	27, 28
10/5/95	343.2-309	29, 30
10/6/95	309-283.1	31
10/12/95	283.1-241.5	32, 33
10/13/95	241.5-203	34, 35, 36
10/14/95	203-150	37, 38
10/15/95	150-109.9	39
10/16/95	109.0-53	40, 41
10/17/95	53-0	42, 43, 44

During the field reconnaissance trip many sites were found to be suitable for further data collection. The number of sites suggested by the Corps of Engineers generally exceeded the sites that the study team could examine each day. Moreover, the video tape did not reveal actual field conditions, especially at sites covered by vegetation. In some instances, dredge disposal sites appeared in the aerial photographs and videotape to be sites with severe erosion. Consequently, the team used two approaches to select a site for detailed data collection. First, the team prepared a list of potential sites based on aerial photographs and videotape review, indicating geomorphic characteristics of the sites (straight reach, crossover, inside or outside bends, etc.). The team then determined the sites that would be visited that day. At significantly eroded sites where the team could not obtain complete data, personnel recorded the main features and called those sites "observation" sites. An observation site was a site that either had features similar to those measured at other sites, or the site was not sufficiently representative to conduct a full-scale survey. A limited amount of data was collected at observation sites.

Erosion Site Mapping

Sub-team 1 was responsible for indicating on navigation charts the various degrees of erosion on both sides of the river by means of a color scheme to indicate the severity of erosion. Evaluations noted on the charts are all approximate, not based on measurements. In spite of these shortcomings, the navigation charts with erosion sites marked still will provide extremely valuable information about the current bank erosion of these two rivers.

Navigation charts were colored to indicate the severity of erosion at various locations, ultimately only four major colors will be included:

red	severe erosion clear scarp with approximate height 4 feet or higher
orange	medium erosion scarp with approximate height less than 4 feet
blue	minor erosion; moderate scarp bare bench
green	stable, almost no erosion

Notes were also written on any navigation features discernible from the boat. Figures 3-5 and 3-6 show two pages from the navigation charts with field notes inscribed. Marked and colored navigation charts were a separate product of this study (appendix J).

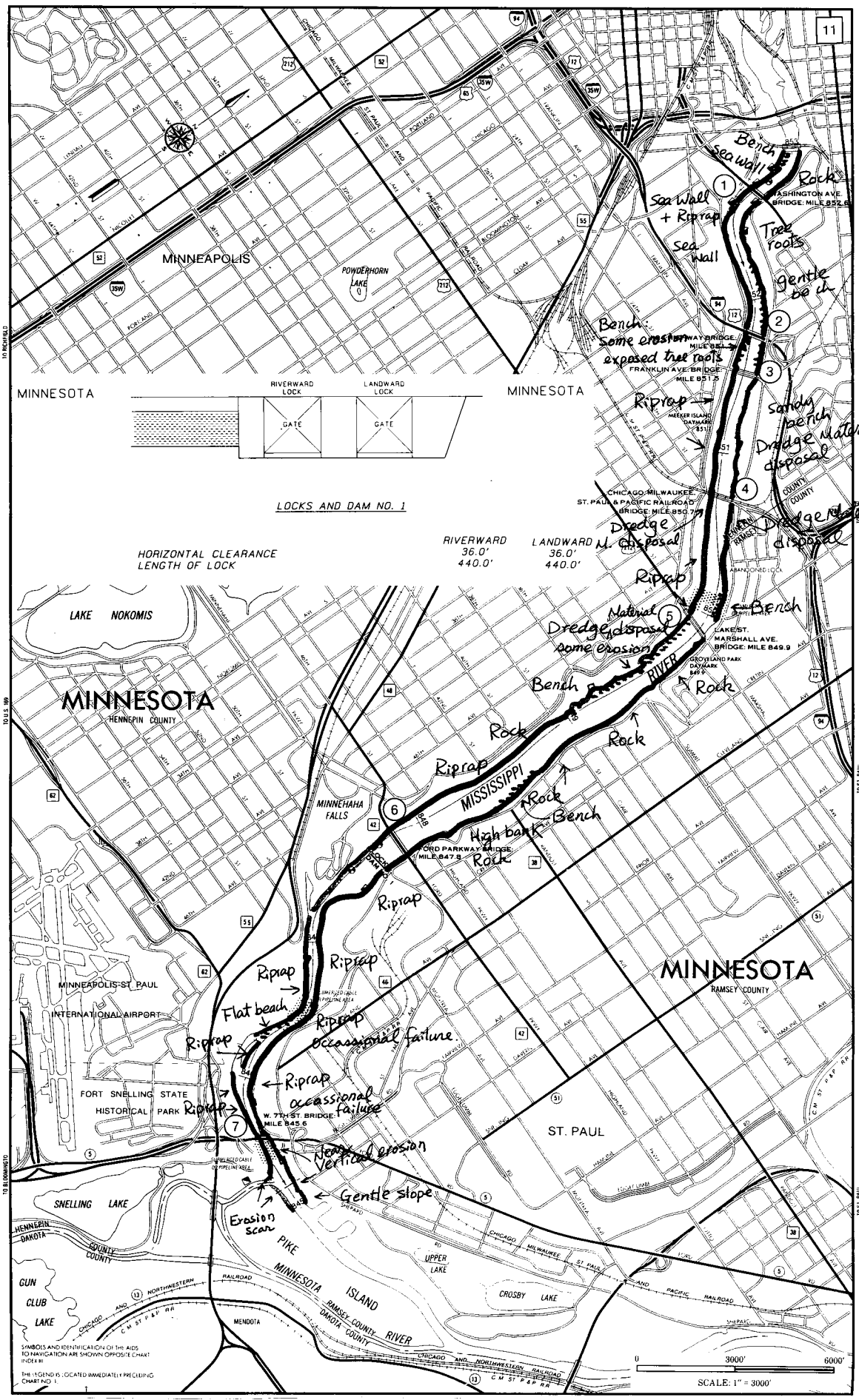


Figure 3-5. Field notation on the Upper Mississippi River navigation chart This reach extends from approximately RM 845 to RM 853

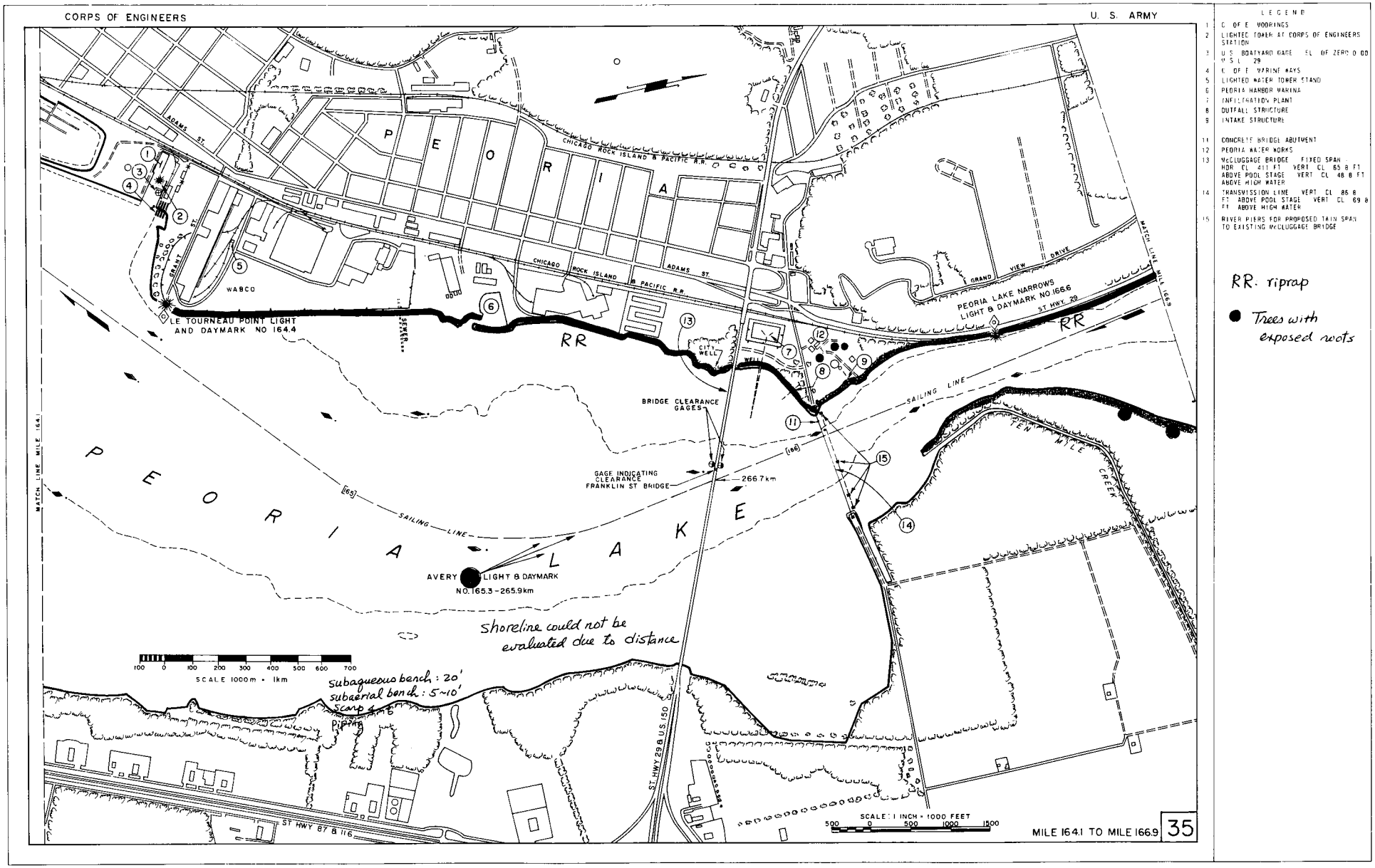


Figure 3-6. Field notation on the Illinois Waterway navigation chart
This reach extends from approximately RM 144.8 to RM 150.6

Field Data Sheets

The study team developed standard field data sheets that were used for the trips on the UMR and the IWW. Figure 3-7 shows a sample data sheet used to record information in the field from the selected site.

Data collected from the observation sites were recorded on an "Observation Data Sheet Form" (figure 3-8). Again, the main information included the location of the observation site, and a description of the surrounding areas, including vegetation, soil types, and in some cases one or more sketches of the bank section. Information collected can be divided into four categories, including bank sections extended from bank crest to a near channel depth of 2 or 3 feet; and soil samples – surficial samples from the bank crest, failure faces, berm, or bench, and core samples from nearshore areas (at depths of 1 or 2 feet); and vegetation, land use, exposed root, and adjacent appearance. Protocols for data collection have been prepared and are given in the sampling section of this chapter that describes sampling activities.

In many instances, three bank sections were chosen at the main site and three data sheets were prepared. For observation sites, normally only one sheet was completed.

Sampling

The field team was divided into two to four sub-teams. Sub-team 1 was responsible for marking the upstream and downstream limits of each site reach and also for collecting data at upstream and downstream quartile points. Sub-team 2 was responsible for the bulk of the data collection effort, concentrated at the midpoint section: a detailed bank section; a river cross section; surficial bank sampling (including core sampling of shallow water soils and sediment); photographing bank soils at each sampling point; and drawing site sketches.

Data collection from the upstream and downstream ends essentially consisted of measuring bank sections occasionally measuring river cross sections, and in a few instances, bank soil and sediment core sampling. Figure 3-9 shows photographs of typical data collection activities at a site on the Illinois River.

0	Recorder's Name(s) -- First/Last	
1	Date & Time (e.g., 8/16/95 13:30)	
2	Weather	
3	River (ILWW/UMR)/Discharge (cfs)	
4	Navigation Pool No.for UMR/Name for ILWW	
5	Flat Pool Elevation (ft)	
6	Local Pool Elevation (ft) (Rising/Falling?)	
7	Site #: (RM @ Midpoint)	
8	Bank Profile (UP/MP/DN?)	
9	Right Bank/Left Bank/Island (Tip/LT/RT/End?)	
10	Approx. RM of Erosion Site (miles)	
11	U/S RM of Erosion Reach (miles)	
12	D/S RM of Erosion Reach (miles)	
13	U/S UTM (x,y)	
14	D/S UTM (x,y)	
15	Natural or Revetted Bank (N/R)	
16	Geomorphic Characteristics (see Codes)*	
17	Surrounding Structures (see Codes)**	
18	Archaeological Site (Y/N)	
19	Recreational Boat Traffic (L/M/H)	
20	Commercial Boat Traffic (Mean Daily Traffic?)	
21	Distance from Edge of Navigation Channel (ft)	
22	Land Use on Bank Crest (see Codes)***	
23	Vegetation at Bank Ledge (see Codes)****	
24	Vegetation on Bank Face (see Codes)****	
25	Assessment of Root Exposure on Bank Face	
26	Alongshore Vegetation (see Codes)*****	
27	Bank Failure Face Height (ft)	
28	Bank Failure Face Slope (ft/ft)	
29	Basal Berm Height (ft)	
30	Basal Berm Width (ft)	
31	Nearshore Underwater Slope (ft/ft)	
32	Bench Description	

Page 1: @ RM _____ on (ILWW/UMR: Pool # _____)

Figure 3-7. Sample data sheet for bank-erosion reconnaissance work group Upper Mississippi River/Illinois Waterway navigation impact study: streambank erosion

*Code for #16	**Code for #17	***Code for # 22
C: Crossover I: Inside bend L: Island O: Outside bend S: Straight reach	C: Side-channels closure structure D: Boat Docks F: Fleeting area M: Mooring area W: Wingdams (I.D. #) & Conditions	A: Agriculture (Type?) G: Grass/Weeds (Species?) H: Highway I: Industrial L: Levee R: Railroad embankment U: Urban W: Wooded (Species?)

****Code for #23 & #24	*****Code for #26
A: Agricultural rows (Type?) G: Grass/Weeds (Type?) W: Wooded (Species?)	N: Nonsubmerged vegetation (Type?) S: Submerged vegetation (Type?)

33	Stage Variability (High, Moderate, Low)	
34	Erosional /Failure Features(Y/N); Description and Location Relative to Measured Profiles	
35	Overbank/Bank Drainage (Y/N); Extent and Location Relative to Measured Profiles	
36	Bank Erosion/Failure Type, Structure, Geometry & Causative Factors (see Code*#)	
37	Bank Failure Face Soil Type (see USC Sheet)	
38	Basal Berm Soil Type (see USC Sheet)	
39	Nearshore Soil Type (see USC Sheet)	
40	Channel Profiles Taken (Y/N?) If Y, how many?	
41	Soil Samples Taken (Y/N?) If Y, how many?	
42	Photographs Taken (Y/N?) If Y, how many?	
43	Video with Naration Taken (Y/N?)	
44	Potential for Future Field Investigations?	
45	Additional General Remarks:	

*#Code for #36	*# Code for #36	
F: Fall	C: Cantilevers	SL: Slaking
RS: Rotational Slump	S: Slabs	P: Piping
PG: Planar Glide	B: Blocks	W: Wave&Prop
LS: Lateral Spreading	L: Loose	Rework&Transport
DS: Debris Slide		

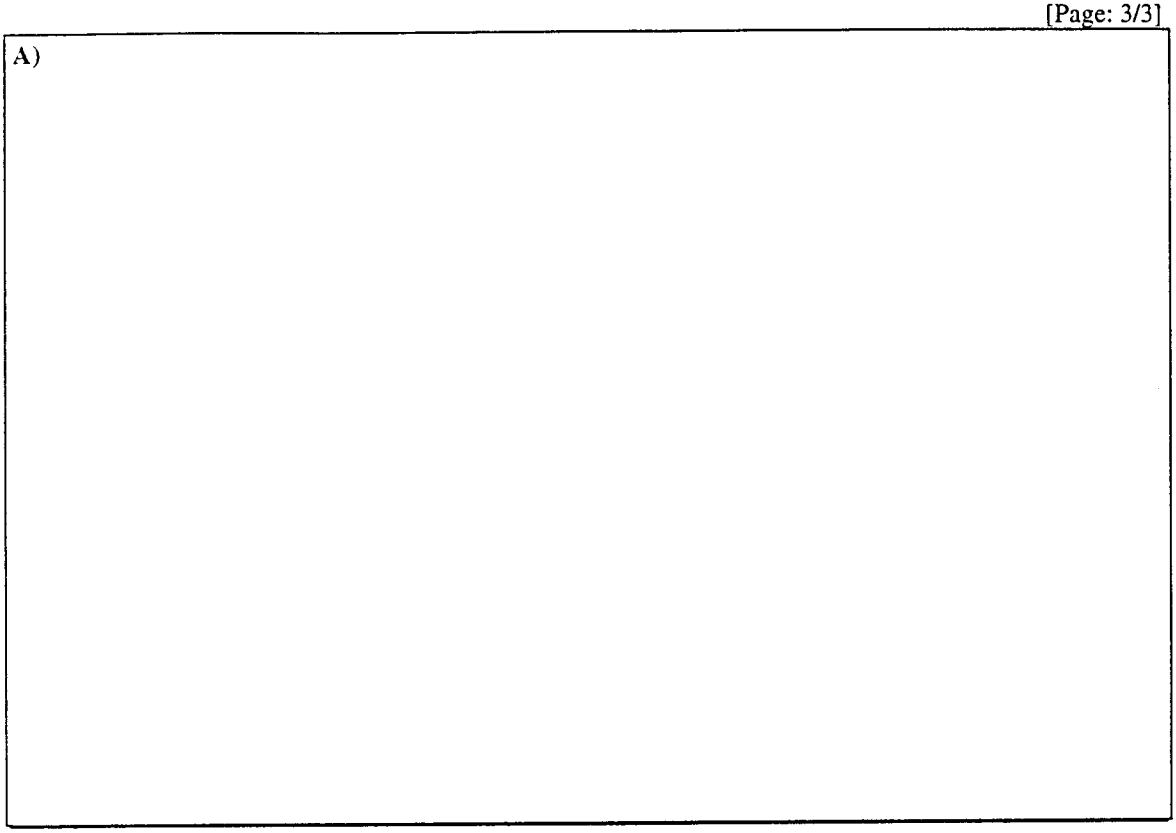
Page 2: @ RM _____ on (ILWW/UMR: Pool # _____)

Figure 3-7. Continued

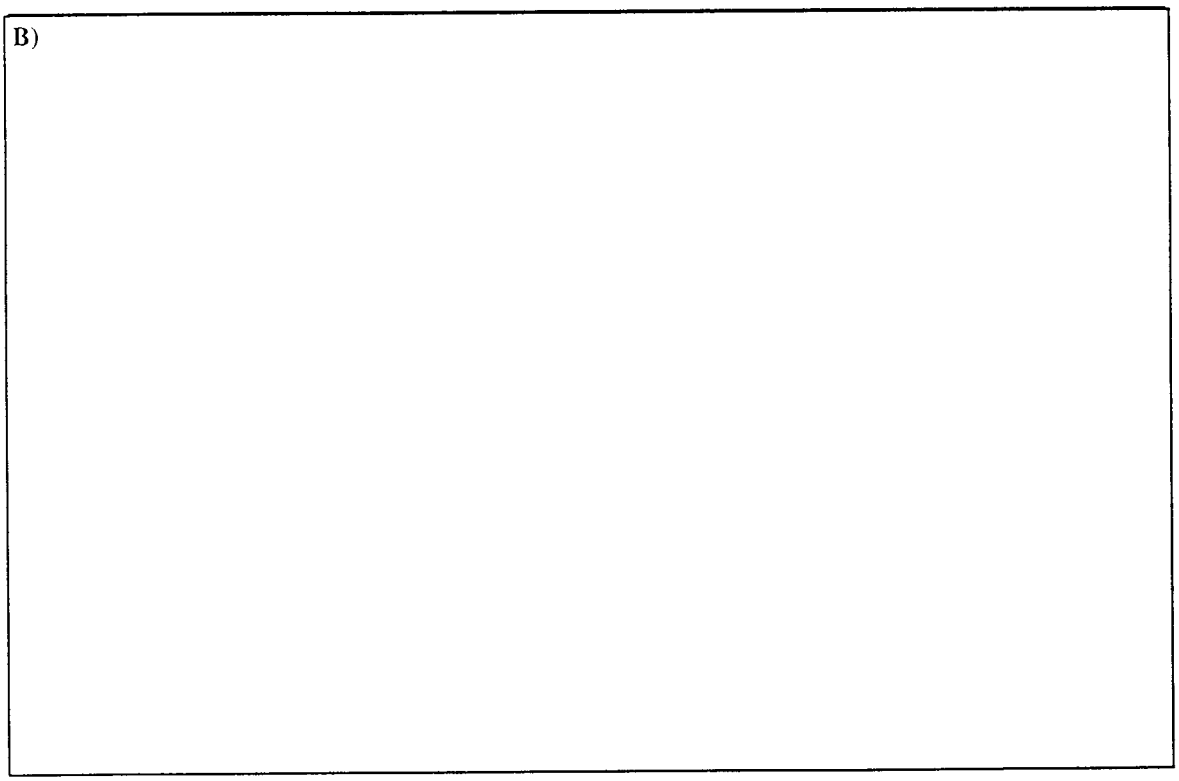
<Bank-Erosion Site Sketches>

[Page: 3/3]

A)



B)



Page 3: @ RM _____ on (ILWW/UMR: Pool # _____)

Figure 3-7. Concluded

1	Date/Time	
2	River Mile (Left/Right)	
3	Navigation Pool Number	
4	UTM Coordinates	
5	Bank Type	
6	Geomorphic Characteristics (see codes)	
7	Surrounding Features	
8	Land Use	
9	Vegetation	
10	Bank Description	
11	Soil Type and Description	
12	Photographs	
13	Geologic Context LSA (see Anderson)	
14	Additional Comments	
15	Bank Sketch - on back (Y/N)	

Figure 3-8. Sample observation site data sheet for bank-erosion reconnaissance work group Upper Mississippi River/Illinois Waterway navigation impact study: streambank erosion

<Bank-Erosion Site Sketches>

A)

B)

@ RM _____ on (ILWW/UMR: Pool # _____)

Bank Sections

Bank sections at most sites were measured using standard surveying equipment, and procedures:

- A temporary benchmark on the bank was established.
- A standard level, leveling rod, and measuring tapes were used to measure the elevations of the bank at various locations on a transit starting from the top of the bank.
- Bank elevation measurements extended from the top of the bank to the water's edge and beyond, into 2-4 feet of water depth.
- All the measurement points, including distances and elevations, were recorded on field notes.
- A sketch of the bank section was also made on the field note pad.
- Similar measurements were occasionally repeated at the upstream or the downstream measuring section.

Bank Soils

Procedures used to collect bank soil samples follow:

- At least three surficial samples were collected at all the midsection measuring sections.
- These samples were collected by using either an ordinary garden shovel or a scraper.
- All the samples were preserved in zip-lock bags and clearly identified with time and date, river, location, river mile, and sample location relative to the bank section.
- Specific sample locations were measured and noted in field notes. Numbered posts in figure 3-9 were the locations where soil samples were taken.
- In general, three to nine samples were collected at each measuring section.
- When deemed necessary, core samples above the water's edge also were collected.

Subaqueous Core Samples

Subaqueous core sampling determined the composition and particle size distribution of these surficial soils and sediment. The sampling procedures were as follows:

- Sampling was done at 1 and 2 foot depths along each profile line.
- A WILDCO core sampler was used with a graduated sample tube.
- The sampler was inserted as far as manually possible, then removed.
- The sampler was kept upright (vertical) after the sample was taken and while the contents of the tube were removed.

- For each sample, the total core length and the length of each separate horizon (with zero at the surface) were recorded on the appropriate sampling bag.
- After the length measurements were made, the sample was removed from the inner graduated tube and placed on a wooden sampling board. The core was divided into horizon samples which were placed in labeled sample bags.
- After each sample was taken the sample tube, corer tip, and corer threads were cleaned thoroughly.

Global Positioning System

A global positioning system (GPS) was used to locate the midsection, upstream limit and downstream limits, and positions of any other important points on each site, to an accuracy of $\pm$ 3 meters. Figure 3-10 shows a photograph of the boat and clearly marked antennas used to measure the cross section.

River Cross sectional Profile

Procedures used to measure the cross section of the river are as follows:

- A boat equipped with a sonar depth sounder with an accuracy of $\pm$ 0.3 meters and a GPS unit were used.
- Once the midsection was located, two end points defining the cross section where depths were to be measured were identified, and the sounding boat was brought as close to the shore as possible.
- Tick marks with distances were noted on the sounding chart, and the exact distance from the starting point was noted on the strip chart. Figure 3-11 shows such two strip charts for sites 4 and 5 on the Illinois River at RM 228.1 and RM 228.5, respectively.
- Strip charts and associated data were subsequently used to develop cross sections of the rivers.

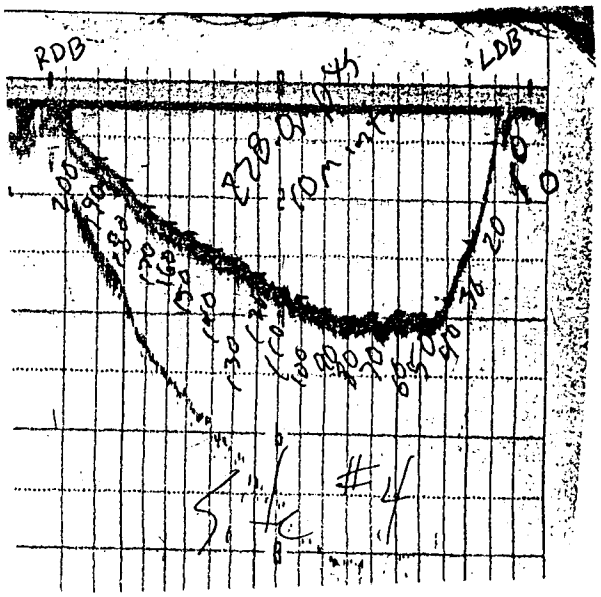
Island Sites

Many island erosion sites displayed similar patterns of bank morphology, erosion, and deposition. The following procedures were used when island sites were sampled:

- Island sites were chosen by consensus of the study team from reaches adjacent to the navigation channel.

Figure 3-9. Typical data collection activities at a bank erosion site

Figure 3-10. River cross section measurement by
A ISWS boat equipped with the GPS and Sonnar



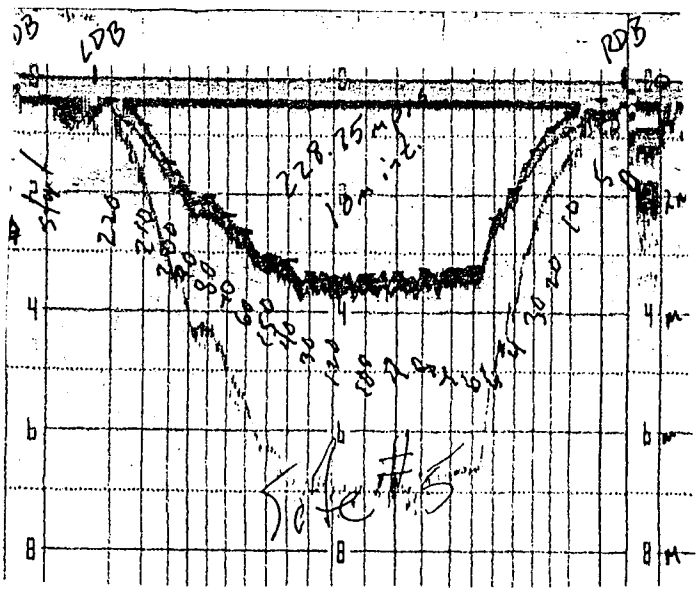


Figure 3-11. Strip chart showing river cross sections on the Illinois River

- In addition to the three bank sections sampled for bank erosion sites, bank sections were taken at the upstream (head) and downstream (tail) ends of the island. Bank sections were also taken on the back of the island (side away from the navigation channel).
- Bank soil and core samples were collected at the midpoint section, and at the upstream and downstream limits.
- At the upstream and downstream limits of a reach, a minimum of one bank sample and one core sample at a 2 foot depth were collected. Additional samples were collected at these locations as necessary, four samples at each location.
- At island sites, bank core samples were collected at the midpoint section. Additional bank cores were collected at the upstream and downstream ends of the island.
- A cross-channel section was measured along the line of the midpoint bank section. Additional cross-channel sections were measured, provided there was sufficient evidence to suggest changes in the channel section along the length of the island.
- Longitudinal profile at several locations along the length of the island approximately 20-30 feet from the edge of water were also measured.

Twenty-nine sites on the IWW and 43 sites on the UMR were selected for detailed data collection during the field visits.

Other Information

The data sheets developed to collect various data from each of the erosion sites also contained information on vegetation, presence of bank revetments, wing dams, tributary mouths, general appearance of the banks, dredge material disposal site close by (if any), land use on bank crest, exposed roots, bench description, bank drainage, presence of seepage, and other related data. This information was contained in the field notes (figure 3-7).

References

Bhowmik, N.G., A.C. Miller, and B.S. Payne. 1990. *Techniques for Studying the Physical Effects of Commercial Navigation Traffic on Aquatic Habits*. Environmental Research Program, U.S. Army Corps of Engineers Technical Report, EL-90-10, 129p.

Bhowmik, N.G. and R.J. Schicht. 1980. *Bank Erosion of the Illinois River*. Report of Investigation 92, Illinois State Water Survey, 2204 Griffith Drive, Champaign, IL 61820, 52p.

Hagerty, D.J. 1988. *Illinois Waterway Bank Evaluation*. Unpublished report submitted to the U.S. Army Corps of Engineers, Rock Island District, 64p

U.S. Army Corps of Engineers. 1974. *Navigation Charts of the Illinois Waterway*. U.S. Army Corps of Engineers District, Chicago. 46p.

U.S. Army Corps of Engineers. 1989. *Navigation Charts of the Upper Mississippi River*. U.S. Army Corps of Engineers districts: Rock Island, St. Louis, St. Paul. 131p.